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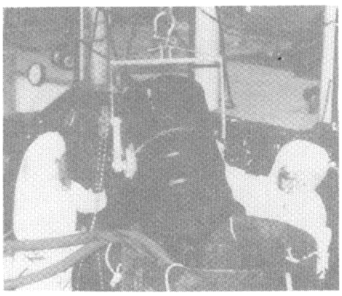

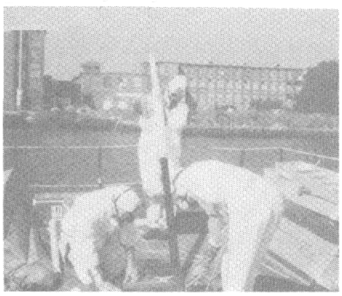

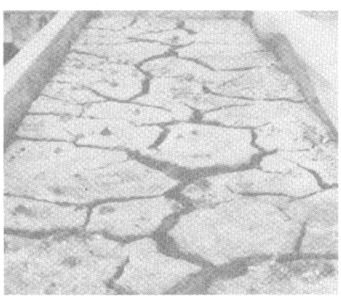

TECHNICAL REPORT EL-88-15

NEW BEDFORD HARBOR SUPERFUND PROJECT, ACUSHNET RIVER ESTUARY ENGINEERING FEASIBILITY STUDY OF DREDGING AND DREDGED MATERIAL DISPOSAL ALTERNATIVES

Report 2

SEDIMENT AND CONTAMINANT HYDRAULIC TRANSPORT INVESTIGATIONS

by

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19. ABSTRACT *(Continue on reverse if necessary and identify by block number)*

This report documents the evaluation of hydraulic conditions and sediment migration associated with the dredging and dredged material disposal alternatives proposed for the upper Acushnet River Estuary upstream of New Bedford Harbor, Massachusetts. Dredging and onsite disposal is one remedial measure being considered by the US Environmental Protection Agency.

Assessments of sediment and contaminant migration beyond the upper New Bedford Harbor from proposed dredging and disposal alternatives were made based on field, laboratory, and various model studies. The upper estuary was found to be depositional and a reasonably efficient sediment trap. Total suspended material (TSM) concentrations were very low in the system.

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Numerical transport model
PCB - Aroclor
Resuspension
Sediment
Settling velocity
Total suspended material (TSM)
Water tunnel

19. ABSTRACT (Continued).

Present tidal-averaged polychlorinated biphenyl (PCB)-Aroclor seaward flux from the upper estuary through the Coggeshall Bridge was about 0.035 g PCB per second, or about 1.55 kg per tidal cycle. The direction of the PCB flux was opposite that of TSM. Diffusion, exchange processes, and soluble transport were concluded to be more important to PCB flux than erosion and transport of bed sediment material. Surface transport of PCB-Aroclor by floatable film was found not to be an important transport mode.

Sampling at and around two composite sampling sites was performed to estimate resuspension rates under actual site conditions. The operation of the sampling vessel caused more resuspension than the box core dredging, indicating that control of vessel operations in the shallow waters in the upper estuary might be more important than controlling dredgehead resuspension. Overall resuspension rates, vessel plus box core dredging, were 40 to 70 g per second.

Resuspension by the dredge was apparently less than about 10 g per second. Settling velocities of bed sediments resuspended during composite sampling operations were relatively high for fine sediments.

Experimentally determined erosion thresholds indicate that confined aquatic disposal (CAD) cells should be sited in areas with relatively low current speeds, and particularly in areas where maximum shear stresses are below 0.06 N/sq m (current speeds below about 12 cm/sec) to avoid resuspension.

Near-field dredge plume and CAD cell deposition models were applied to cleanup dredging scenarios. Results from the dredge plume model indicated that an average, weighted by occurrence frequencies, of about 29 percent of the resuspended material will escape the 100-m radius of the dredging site. Results from the CAD cell model indicated that all of the fine resuspended material expelled from the slurry with the pore water will escape from the CAD cell.

A vertically averaged two-dimensional numerical transport model was also applied to the estuary. Results indicate that the flux of sediment material from the upper estuary would be 15 to 20 percent of the rate of sediment resuspension.

Sediment migration simulation results combined with assumed resuspension rates (40 g/sec) indicated that the average flux of suspended sediment during midestuary dredging would be about 11.6 g/sec at the 100-m radius and about 7.6 g/per sec through the Coggeshall Street Bridge.

PREFACE

This study was conducted as a part of the Acushnet River Estuary Engineering Feasibility Study (EFS) of Alternatives for Dredging and Dredged Material Disposal. The US Army Corps of Engineers (USACE) performed the EFS for the US Environmental Protection Agency (USEPA), Region 1, as a component of the comprehensive USEPA Feasibility Study for the New Bedford Harbor Superfund Site, New Bedford, MA. This report, Report 2 of a series, was prepared at the US Army Engineer Waterways Experiment Station (WES) in cooperation with the New England Division, USACE. Coordination and management support was provided by the Omaha District, USACE, and dredging program coordination was provided by the Dredging Division, USACE.

Project manager for the USEPA was Mr. Frank Ciavattieri. The New England Division project managers were Messrs. Mark J. Otis and Alan Randall. Omaha District project managers were Messrs. Kevin Mayberry and William Bonneau. Project managers for the WES were Messrs. Norman R. Francingues, Jr., and Daniel E. Averett.

The study was conducted and the report prepared by Mr. Allen M. Teeter, Hydraulics Laboratory (HL), WES. Mr. Walter Pankow assisted in the preparation of the report. Mr. Howard Benson of the Estuarine Processes Branch (HE-P) supervised the execution of the field data collection. Messrs. Joseph W. Parman, Larry G. Caviness, Samuel E. Varnell, Billy G. Moore, and James T. Hilbun of the HE-P collected data in the field. Mr. Caviness performed laboratory experiments on deposition and erosion. Dr. Bufu Yu conducted the numerical estuarine modeling under the terms of an Intergovernmental Personnel Act agreement with Johns Hopkins University. The report was edited by Ms. Jessica S. Ruff of the WES Information Technology Laboratory.

The study was conducted during the period February 1986 to July 1987 under the general supervision of Messrs. Frank A. Herrmann, Chief, HL; Richard A. Sager, Assistant Chief, HL; William H. McAnally, Jr., Chief, Estuaries Division; and George M. Fisackerly, Chief, HE-P.

COL Dwayne G. Lee, EN, was Commander and Director of WES. Dr. Robert W. Whalin was the Technical Director.

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CONVERSION FACTORS, NON-SI TO SI (METRIC) UNITS OF MEASUREMENT

Non-SI units of measurement used in this report can be converted to SI (metric) units as follows:

Multiply	By	To Obtain
cubic yards	0.7645549	cubic metres
feet	0.3048	metres
horsepower (550 foot-pounds (force) per second)	745.6999	watts
yards	0.9144	metres